User Manual

PVI1300/1800/2300/2700/3000/3200/4000/4600/5400TL

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1. Introduction

1.1. Introduction

This manual describes Trannergy solar inverters PVI1300TL,PVI1800TL ,PVI2300TL, PVI2700TL,PVI3000TL,PVI3200TL, PVI4000TL, PVI4600TL and PVI5400TL. These products are among the most technologically advanced and efficient inverters on the market and are designed to ensure a stable power supply for many years.

The PVI inverter is a transformerless based inverter.

1.2. How to Use this manual

Please read the safety instructions in this manual first. Throughout the manual it is assumed that the reader is familiar with AC and DC installations and knows the rules and regulations for electrical equipment and for connecting it to the utility AC grid. It is especially important to be familiar with the general safety rules for working with electrical equipment.

1.3. Applied Designations (Warning, Caution, Note)

Throughout the manual important information is shown at different levels depending on the character of the information, as shown here:

	Safety information important for human safety. Violation of warnings may result in injury to persons or death.

	Information important for the protection of property. Violation of this type of information may cause damage and loss of property.

	Useful additional information or “Tips and Tricks" on specific subjects.

1.4. Important Safety Information

Read this before installing, operating or maintaining the inverter.

Before installation:

Check for damage to inverter and packaging. If you are in doubt, please contact your supplier before installing the inverter. Check the voltages of the solar modules and make sure they are within the limits of the Trannergy inverter specifications before connecting them to the inverter.

Installation:

Only trained and authorized personnel familiar with local electrical codes may install the inverter. For optimum safety, please follow the steps described in this manual. Keep in mind that the inverter has two voltage carrying sides, the PV input and the AC grid.

Disconnecting the inverter:

Always disconnect the AC line first! Afterwards disconnect the PV lines. Note that the inverter can still be charged with very high voltages at hazardous levels even when it is disconnected from grid/mains and solar modules. Wait at least 15 min. before proceeding, after having disconnected from grid and PV panels.

operating the inverter:

Before connecting the AC grid to the inverter, make sure that the installation cover is mounted again. The inverter must not be open during operation.

Maintenance and modification:

Only authorized personnel are allowed to repair or modify the inverter. To ensure optimum safety for user and environment, only the original spare parts available from your supplier should be used.

Functional safety parameters:

Unauthorized changes of functional safety parameters may cause injury or accidents to people or inverter. Additionally it will lead to the cancelling of all inverter operating approval certificates. The Trannergy inverters in the PVI range are all designed according to the German VDE0126-1-1standard.

If non-original spare parts are used, the compliance with CE guidelines in respect of electrical safety, EMC and machine safety is not guaranteed.

1.5. General Safety Rules for Working on Electrical Equipment

All persons installing, maintaining or servicing inverters should be trained in and have experience with the general safety rules to be observed when working on electrical equipment.

Installation and service personnel should also be familiar with local requirements, rules and regulations as well as safety requirements.

To provide a general guideline for safety precautions, five well-known and widely accepted rules are repeated below. The list should by no means be considered as exhaustive.

The person performing work on electrical equipment is responsible for the safety of persons and property!

Disconnecting

Disconnect all cables supplying voltage to the working place before starting any work. Please note that a lack of voltage is no guarantee that disconnection has been performed.

Protecting against reconnection

Prevent the system from reconnecting by marking, closing or locking off the work area. Unintentional reconnection may result in severe accidents.

Checking that system is voltage free

Ascertain conclusively by means of a voltage tester that the system is voltage free. Check all terminals to ensure that the system is voltage free (on each individual conductor).

Covering adjacent voltage-carrying components and preventing persons from gaining access to them

Cover up all voltage-carrying system components that can harm you while working. Make sure that danger areas are clearly marked.

1.6. System Sizing

When dimensioning a photovoltaic system, it must be ensured that the open circuit voltage of the PV string never exceeds the maximum permissible input voltage of 600V DC. The PV string open circuit voltage during parallel string operation is 450V DC (PVI1300TL/PVI1800TL),500V (PVI2300TL /PVI2700TL /PVI3000TL) and 550V(PVI3200TL /PVI4000TL /PVI4600TL /PVI5400TL) respectively. Higher voltages may result in permanent damage to the inverter.

In Europe, the PV string open circuit voltage is normally calculated at a module temperature of M10NC or M20NC depending on the location.

The selection of PV string output should be based on the optimum utilization of the invested capital compared to the expected annual energy yield from the system. This optimization depends on local weather conditions and should be considered in each individual case.

The inverter incorporates an input power limiting device, which automatically keeps the power at levels that are safe for the inverter. The limitation depends mainly on internal and ambient temperatures. The limitation is calculated continuously and always allows the maximum possible amount of energy to be produced.

Please use the tool supplied by Trannergy when dimensioning a photovoltaic system.

1.7. DC-switch

On1y trained and authorized personnel familiar with local electrical codes may perform service or maintenance on the inverter. Before opening the inverter:

1) Disconnect AC grid.
2) Disconnect DC power.
3) Remove both AC and DC 1ines.

1) To switch OFF all power supply from the PV panels turn the DC-switch to OFF (O).

2) To switch ON power supply from the PV panel turn the DC-switch to ON (I).

To ensure the functiona1ity of the DC-switch, a11 switches shou1d be switched on and off (by turning the switch to on and off positions ten times) once a year, to c1ean the contacts.

2. Technical Description of Inverters

2.1. Mechanical design

Figure 2-1 shows the outline dimensions of PVI1300/1800/2300/2700/3000TL:

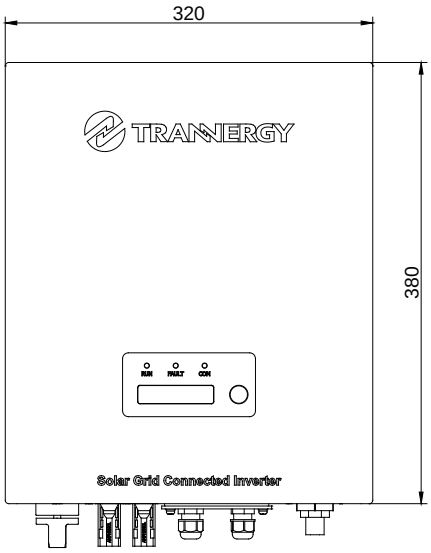


Figure 2-1

Figure 2-2 shows the outline dimensions of PVI3200/4000/4600/5400TL:

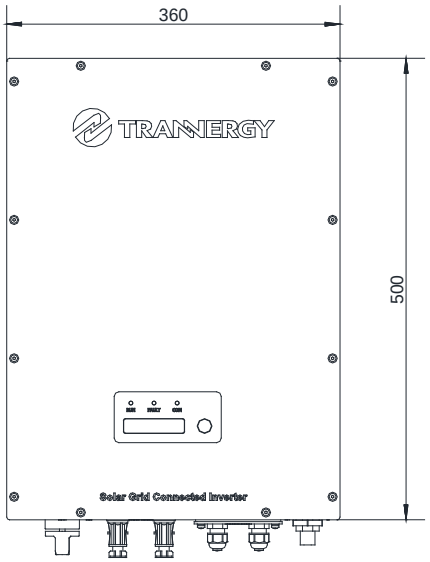


Figure 2-2

Note: The AC output terminal is most length part at the bottom of inverter, so take care of the AC output terminals, do not make it stand on the ground or other materials while moving or lifting the inverters otherwise will make terminal damaged.

2.2. Electrical system design

Figure 2-3 shows the wiring diagram of the whole PVI1300/1800 /2300 /2700 /3000 / 3200/4000/ 4600/5400TL systems.

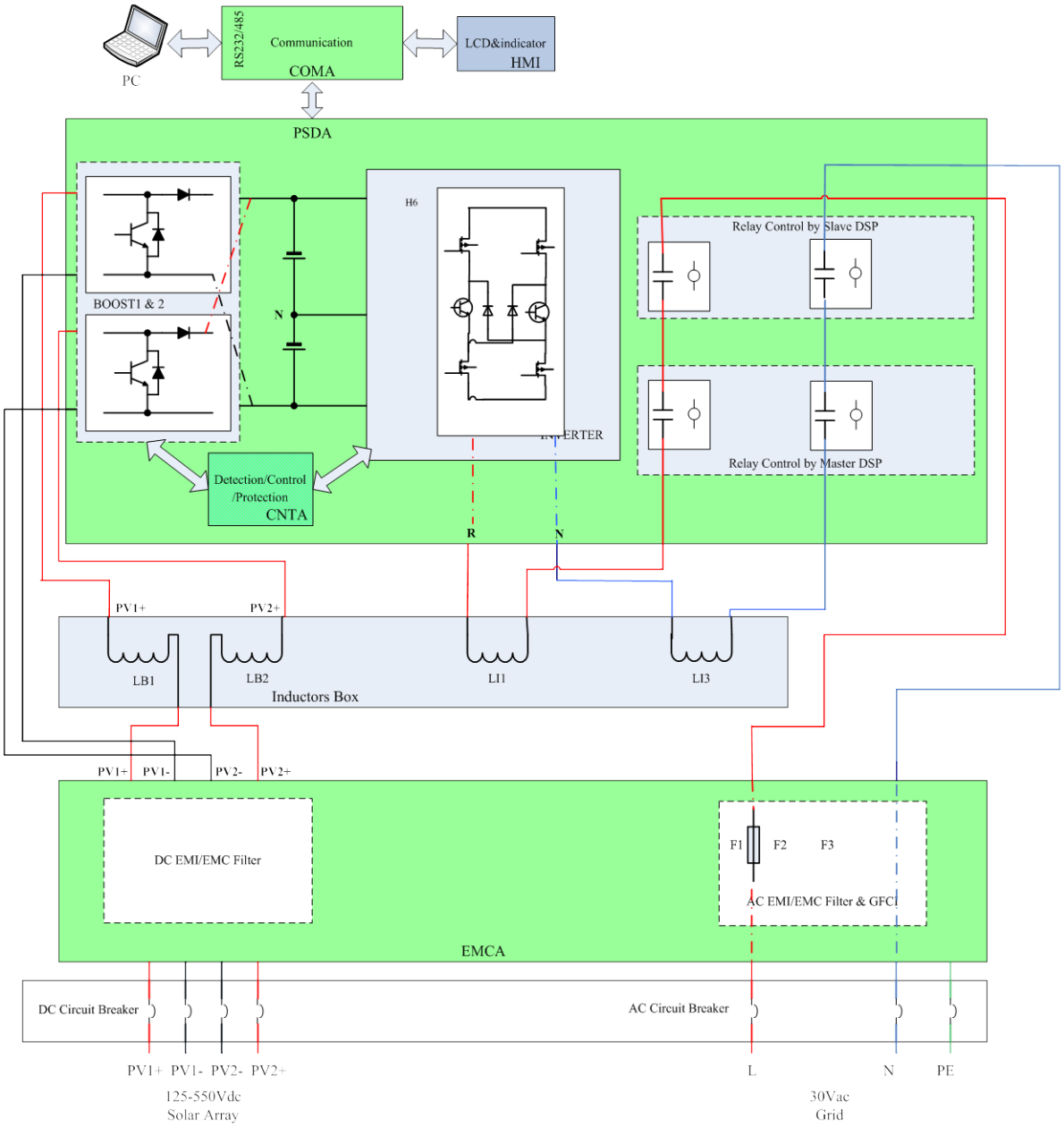


Figure 2-3 wiring diagram of the whole PVI1300/1800/2300/2700/3000/3200/4000/4600/5400TL system

We recommend a 32A DC Breaker located at the input of the DC input, and a 32A AC Breaker located at the output of the AC part.

Notes:

When choose the breaker, please call your installer for technique support

For the input and output wire selection, we recommend UL1015 wire, please see the following table.

Model	**PVI1300/1800/2300/2700/3000/3200TL**	**PVI4000/4600/5400TL**
DC input	14AWG	12AWG
AC output	14AWG	12AWG

Notes:

Before install the inverter, please firstly check the polarity of the PV side, and a wrong polarity to the inverter may lead to a permanent damage

The above recommended wire already consider the maximum work current and degrading

3. Operation Mode Definition

The inverter has four standard operation modes.

3.1. Waiting mode

In waiting mode, the inverter is ready to switch into connecting mode. As decision variable the input voltage of the PV generator is used. Inverter is waiting to checking when output DC voltage from PV panels is greater than 100V (lowest start-up voltage) but less than 150V (lowest operating voltage). If the input voltage exceeds 150V, the inverter shifts from "standby" to "connecting", or continues into the operation model OFF" if the PV voltage drops.

3.2. Connecting mode

After performing the system tests, which check whether all connection conditions are met, the inverter goes from waiting mode to connecting mode. During the specified cut-in time, the inverter continues testing the system values and connects the inverter to the grid if the system tests are okay. The minimum cut-in time is specified by the supplier and authorities and can vary from region to region.

3.3. Normal mode

In this mode, the inverter is connected to the grid and supplies power to the grid. Inverter begins to operate normally with green light on. Meanwhile, feedback energy to grid, LCD displays present output power, and inverter will stop feedbacks power to grid when PV power is not enough. The inverter is only disconnected from the grid in case of abnormal grid conditions or when PV power is not available.

3.4. Fault mode

If the red LED on the front panel light up, the inverter enters the fault mode. The following solutions for trouble shooting are recommended:

	LCD display	Possible actions
Resumable Fault	Isolation Fault	1. Check the impedance between PV (+)&PV(-) and the inverter is earthed. The impedance must be greater than 2MΩ 2. Check whether the AC end has contacted with earth
	Ground Fault	1. The ground current is too high 2. After cutting off the AC end connection, unplug the inputs from the PV generator and check the peripheral AC system. 3. After the cause is cleared, re-plug the PV generator and AC connection, and check PV-Inverter status.
	Grid Fault Fac Over Range Vac Over Range	1. Wait for a moment, if the grid returns to normal, PV-Inverter automatically restarts. 2. Make sure grid voltage and frequency meet the specifications.
	Utility Loss	1. Grid is not connected. 2. Check grid connection cables. 3. Check grid usability. 4. If grid is ok, the problem persists, maybe the fuse in the inverter is open, please call the service.
	Over Temperature	1. The internal temperature is higher than specified normal value. 2. Find a way to reduce the ambient temperature or move the inverter to cooler environment.
	PV over voltage	1. Check the open circuit voltage of the PV generator, see if it is greater than or too close to 450VDC (for PVI1300TL/PVI1800TL) or 500VDC (for PVI2300TL /PVI2700TL /PVI3000TL) 2. If PV voltage is less than 450VDC or 500VDC, and the problem still occurs, please call the service.
Permanent Fault	Consistent Fault	Disconnect PV (+) or PV(-) from the input, restart the inverter.
	Relay-Check Fail	1. Disconnect all PV (+) or PV (-) 2. Wait for a few seconds. 3. After the LCD switches off, reconnect and check again. 4. If the problems remain, please call the service.
	DC INJ High	
	EEPROM R/W Fail	
	SCI Failure	
	AC HCT Fault	
	GFCI Failure	

4. Installation and startup

4.1. Installation precaution

Danger!

Danger of lethal injury due to fire or explosion!
The Trannergy inverter may become hot in normal operation.
Do not install the Trannergy inverter on easily flammable materials and where flammable materials are stored.

Do not install the Trannergy inverter where there is a risk of explosion.

Caution!

Danger of burns from hot housing components!

Install the Trannergy inverter at a proper place where it cannot be touched unintentional.

Dimensions for PVI1300/1800TL/PVI2300TL/PVI2700TL/PVI3000TL:

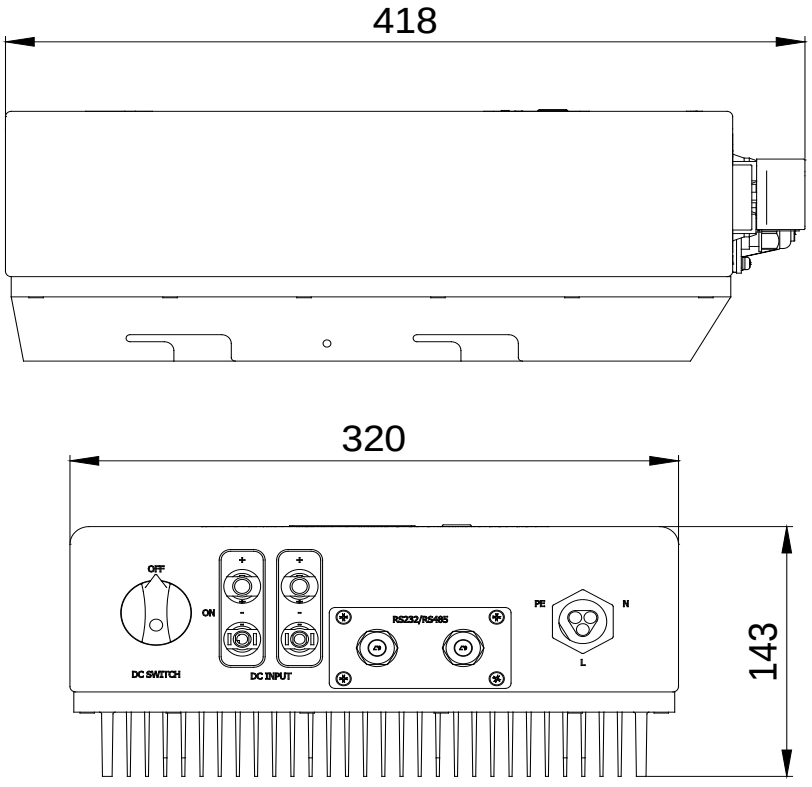


Figure 4-1

Dimensions for PVI3200TL/ PVI4000TL/PVI4600TL/PVI5400TL:

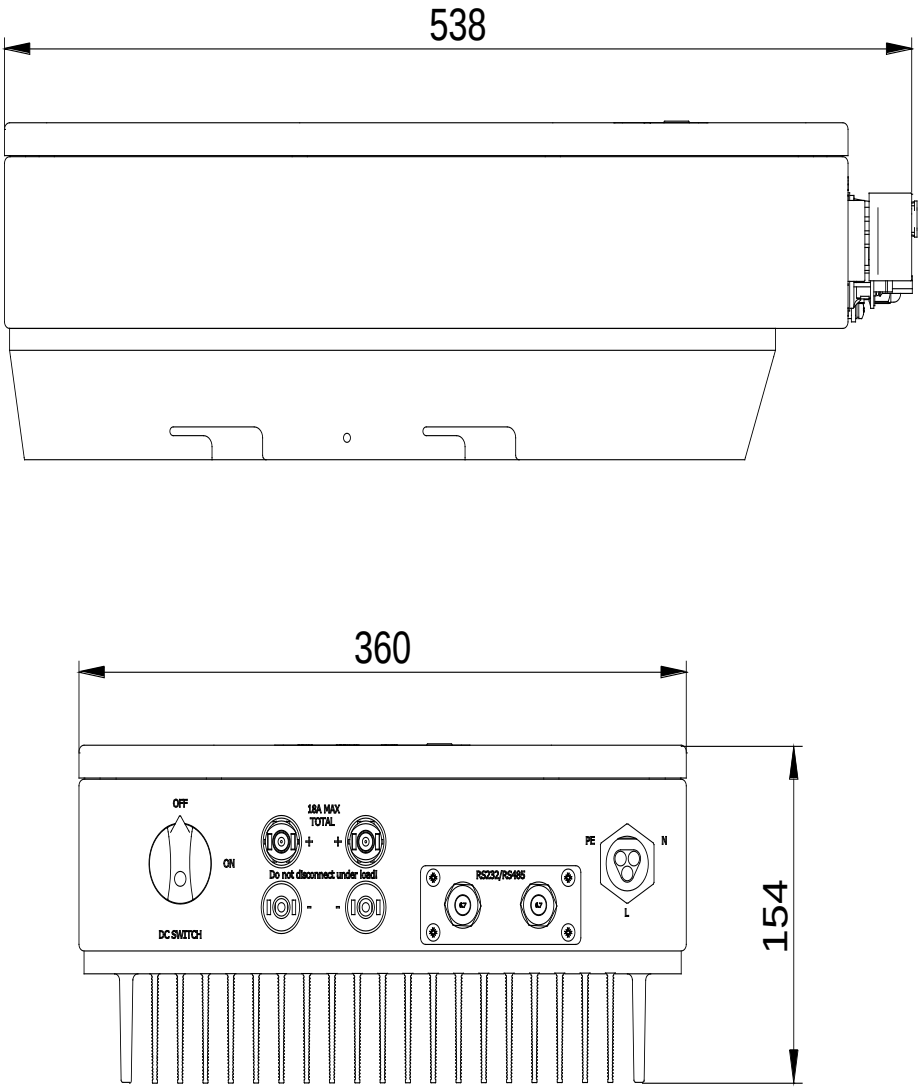
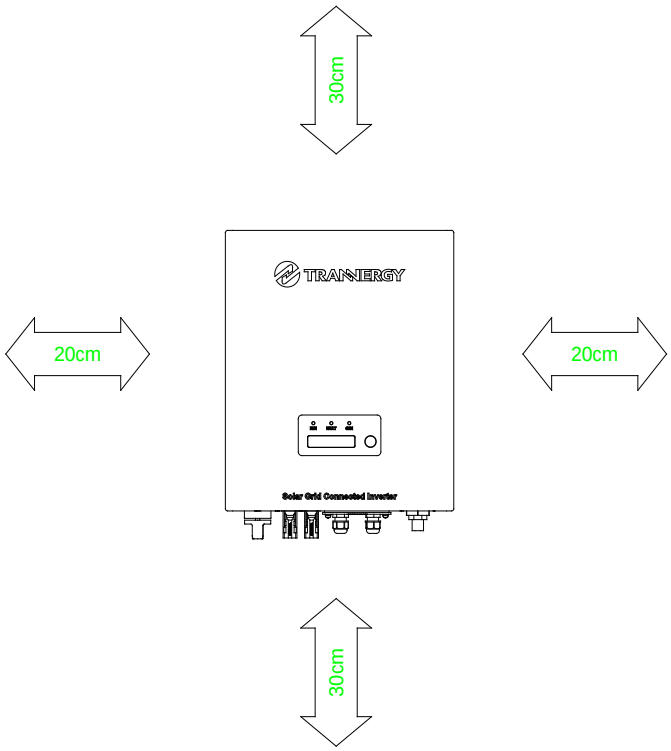


Figure 4-2

Ambient conditions

- The area where the Trannergy inverter installed is as dry as possible in order to extend their service life.
- Ensure good access to the unit for installation or any service work that may later be required.
- Ensure that equipment out of the children's reach.
- Maintain the following minimum clearances around the unit:



Direction	Minimum clearance
Above	30cm
Below	30cm
sides	20cm

Figure 4-3

- Do not expose the Trannergy inverter to direct sunlight, in order to avoid power reduction by excessive heating. That the ambient temperature keeps below 45℃ will guarantee optimal operation.
- Provide better ventilation for the inverter to ensure that heat is dissipated adequately.
- Install the inverter on a solid surface. Because of the noises made by the inverter when in operating, do not install the unit on plasterboard walls in order to avoid audible vibrations.
- If the inverter is installed in the residential area, it should be fixed onto the concrete wall. Wooden wall or plastic board is not recommended.
- If the wall is wooden, please insert the heat isolated material between the inverter and the wall.

Ambient conditions

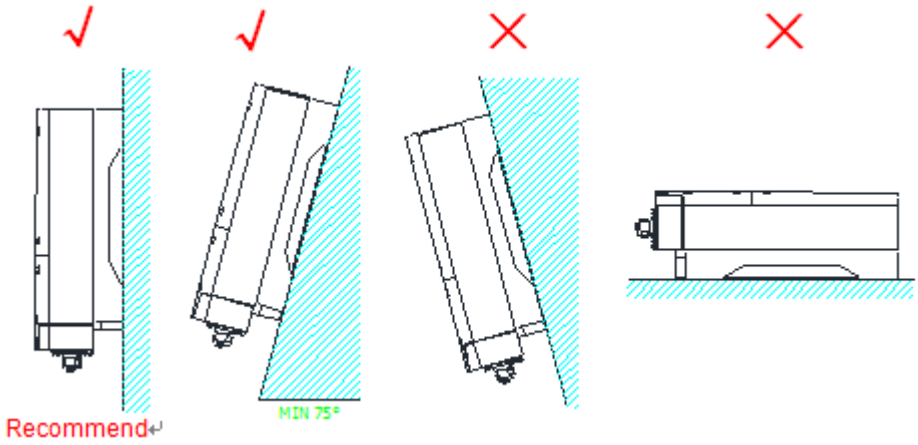


Figure 4-4

- The unit has been designed for vertical or tilted backwards by max.15° installation.
- Do not install the Trannergy inverter forwards.
- Never install it horizontally.
- Install at eye level makes it easier to operate and read the display.

4.2. Installing the inverter

Installing procedure:

a) Drilling holes

Drill four screw holes according to the holes on the installing board. Keep drilling vertical to the wall, and don't shake the drill to avoid holes tilting. The depth of the holes must be the same and 38 mm~45 mm. After removing the dust in the four holes, measure the net depth of the holes. If the depth is deeper than 45 mm or less than 38 mm, the expansion tubes wouldn't be installed and tightened.

b) Install the Installation board

After drilling holes in the wall, fix the installation board (object 2) on the wall with the expansion bolts (object 1).

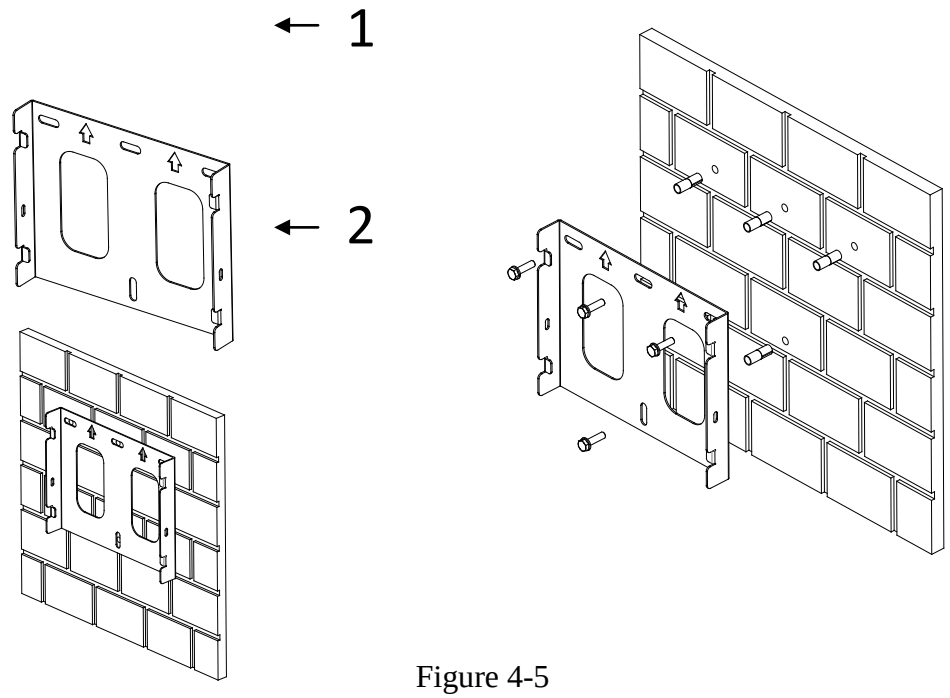


Figure 4-5

Attention!

Before inserting expansion bolts, measure the depth of every hole and measure the distance between every two holes. If the measures values do not meet installing requirements, re-drill holes in the wall.

c) Hung the inverter on the installation board,Fit washers and bolts(double)

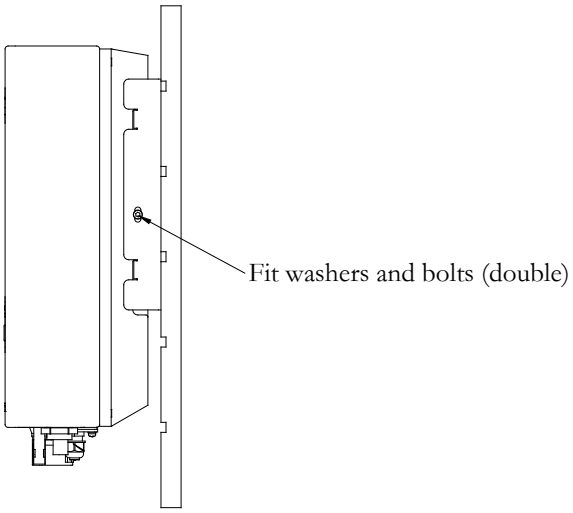
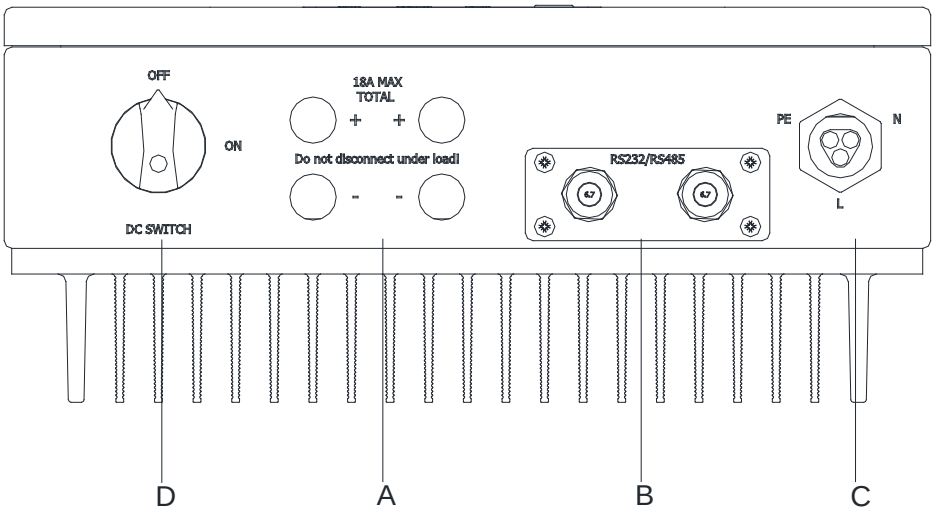


Figure 4-6

d) Check both sides for correct positioning.

4.3. Electrical connection

Product A:



Product B:

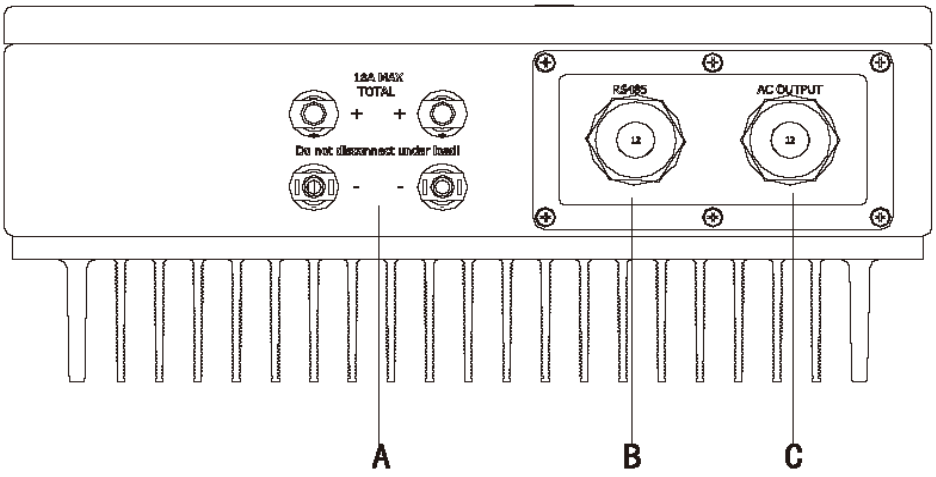


Figure 4-7

Object	Description
A	Plug connectors for DC input. Their polarity is signed lost to the Corresponding connectors
B	Communication terminal：RS485 or RS232 interface
C	Terminal for grid connection (AC output)
D	DC Switch（optional）

Note!

1) After the inverter has been installed in its fixed position, the electrical connection to the unit can be established.
2) Make sure Max. Open Voltage and short-circuit current of the PV string accord with the Spec.
3) Choose the appropriate cable width for AC/DC wire.
4) To connect the inverter, the AC and DC side must be disconnected from all power.
5) Sources and secured against being inadvertently switched back on.
6) Before connecting inverter to PV modules and public grid, please make sure the Polarity is correct.

4.3.1 Connection to the grid (AC) for Product A

Attention!

You must safeguard each inverter with an individual AC breaker in order that the inverter can be safely disconnected under load.

Please connect AC wires with the inverter via the AC female connector（see Figure4-8）obey the procedures below:

Figure 4-8

- Assemble the cover and cable gland, see Figure 4-9.

Figure 4-9

- Strip the jacket of cable(40±1mm) and strip the insulation(7.5±0.5mm), see Figure 4-10.

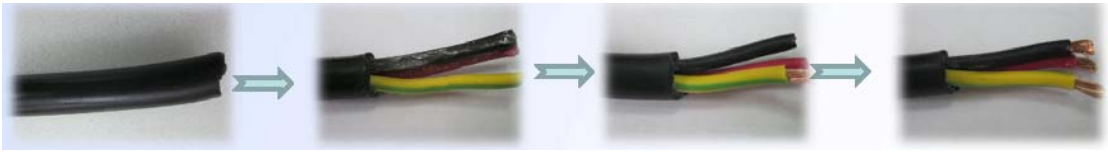


Figure 4-10

- Amphenol specified strip tool can be used in this step. Adjust the striper stopper and put the cable in the corresponding notch to strip the length of 7.5mm as male side.
- Insert the conductors into the corresponding terminal and the screw is tightened with the torque 0,8Nm, see Figure4-11.

Figure 4-11

- Assemble the cover &insert and cable gland using wrench tool (Torque of tightening rear enclosure:5 Nm, torque of tightening cable: 3,3Nm), see Figure4-12.

Figure 4-12

- Mate and separate connector
- After wrest the cable gland. align male and female side and mate them together by hand until a “Click” is heard or felt, see Figure4-13.

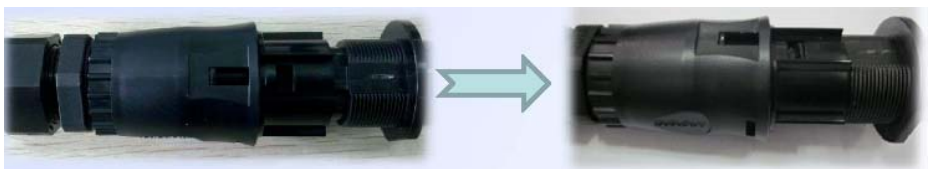


Figure 4-13

- When the separation of connector is necessary, use common tool to separate （A word screwdriver）.
- Lay the tooling in the location of snap and press the tool down. Then the male side can be pushed from the female insert by hand, see Figure4-14.

Figure 4-14

- Lay the tooling in the location of snap in cover and press the tool down. When there is space，then the female side can be pushed from the cover by hand, see Figure4-15.

Figure 4-15

- When it is the necessary the male contact is taken out from insert. Use the Amphenol specified tool TS30-001 as Figure 4-16.

Figure 4-16

4.3.2 Connection to the grid (AC) for Product B

- Connect the AC cable to the terminal, see Figure4-17.

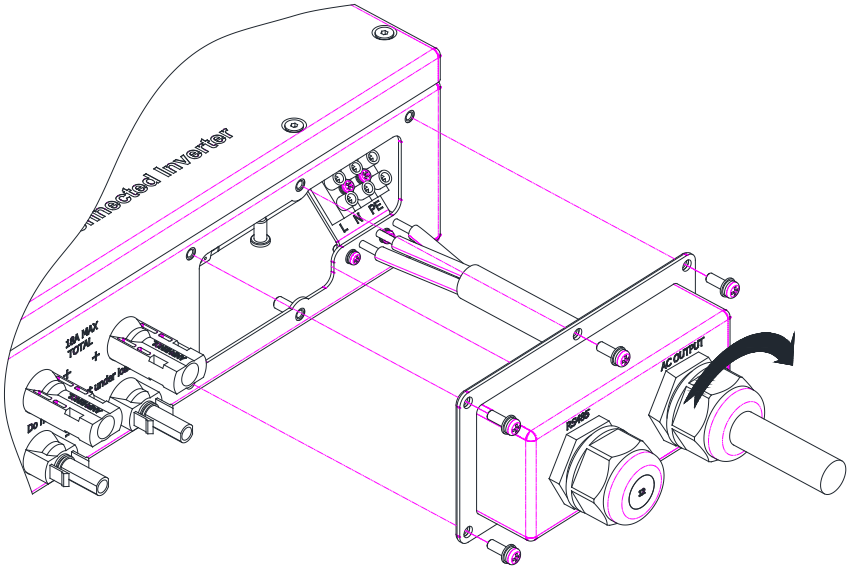


Figure 4-17

DANGER!

DANGER to life due to potential fire or electricity shock.

NEVER connect or disconnect the AC connections under load.

4.3.3 Connection to the PV generator (DC) for Product A&B

Attention!

In order to safeguard the installation and startup of the device, a manual DC breaker must be fit at the input end of the inverter. The breaker should have certain capacity of over current and over voltage.

In addition, before cutting off the DC end connection please cut off the AC end connection at first.

Type	Maximum input voltage[V]	Maximum input current[A]
PVI1300TL	450	18.4
PVI1800TL	450	18.4
PVI2300TL	500	18.4

PVI2700TL	500	20
PVI3000TL	500	20
PVI3200TL	550	20
PVI4000TL	550	20
PVI4600TL	550	20
PVI5400TL	550	20

For the inverter PVI1300TL/1800TL/PVI2300TL/PVI2700TL/PVI3000TL, there is a pair of DC connection and one MPPT tracker.

For the inverter PVI3200TL, PVI4000TL, PVI4600TL and PVI5400TL, there are two pair of DC connection and two MPPT trackers.

Attention!

The open circuit voltage of the PV generator must be measured, which must not exceed the maximum input voltage of the unit. Connecting to a higher voltage will destroy the unit.

The total short circuit current of the PV modules should be less than the inverter's maximum DC input current.

Before connecting PV generator to the unit, please make sure the polarity of the strings is correct.

Please use professional tools to mate and separate H4 connectors.

Connection procedure by H4:

Connect the PV generator and the inverter using H4 connectors as below. The positive and negative terminals of the PV generator are corresponding to positive (+) terminals and negative (-) terminals on the inverter, see Figure4-18&4-19.

Helios H4 components come pre-assembled and the caps are loose.
And the whole connector will include the male side and female side.
AMPHENOL

Figure4-18 Female side connector (+) Figure4-19 Male side connector (-)

- Switch off the DC breaker and secure against being switched back on inadvertently.

- Strip the cable 7 mm, see Figure4-20.

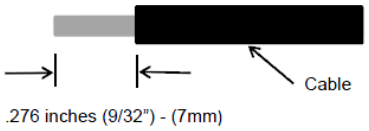


Figure 4-20

- Insert striped cable into contact barrel, and insure all conductor strands are captured in the contact barrel.
- Crimp contact barrel by using a hex crimping die. A specified crimping tool can be used in this step. Put the contact barrel with striped cable in the corresponding crimping notch and crimp the contact, see Figure4-21&4-22.

Figure 4-21

Figure 4-22

- Insert contact cable assembly into back of male and female side connector. A "click" should be heard or felt when the contact cable assembly is seated correctly, see Figure4-23.

Figure 4-23

DANGER!

DANGER to life due to potential fire or electricity shock.

NEVER connect or disconnect the connectors under load.

4.4. Run the inverter

Start inverter after checking all below steps

a) Make sure all the DC breaker and AC breaker are disconnected.

b) AC cable is connected to grid correctly.

c) All PV panels are connected to inverter correctly，DC connectors which are not used should be sealed by cover.

Start inverter

a) Turn on DC and AC side switches.

b) Inverter will start up automatically when PV panels generate enough energy. Below is three different states when operating （Waiting，Connecting, and Normal）, which means inverter starting up successfully. See Chapter 3 for details.

5. Human Machine Interface

5.1. Control Panel

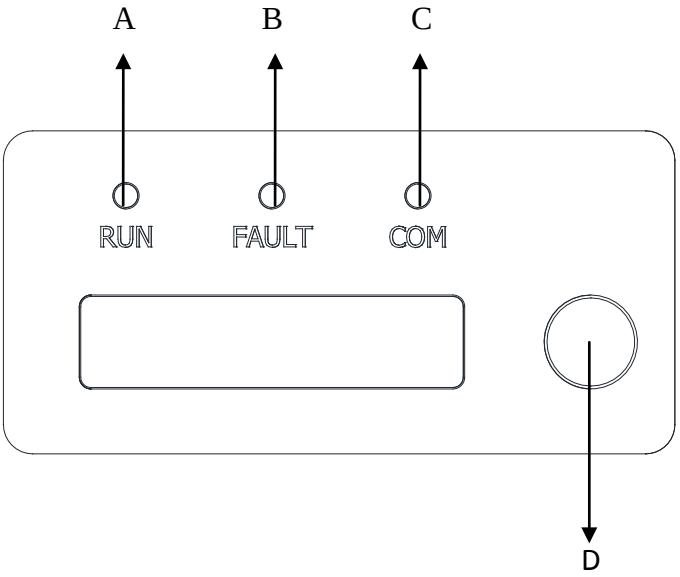


Figure 5-1

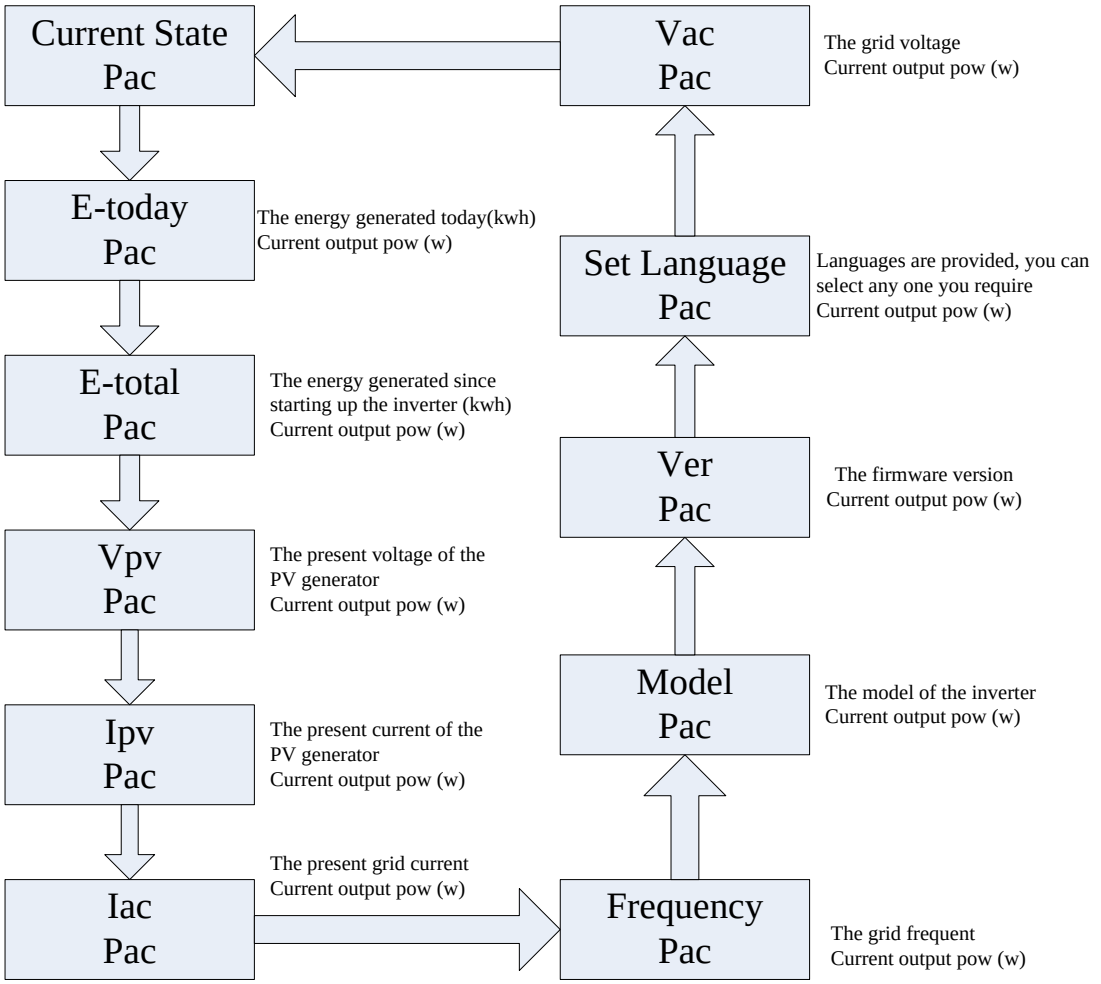
A—Green LED: Working Normally

B—Red LED: Fault detected.

C—Yellow LED: Communication or updating firmware

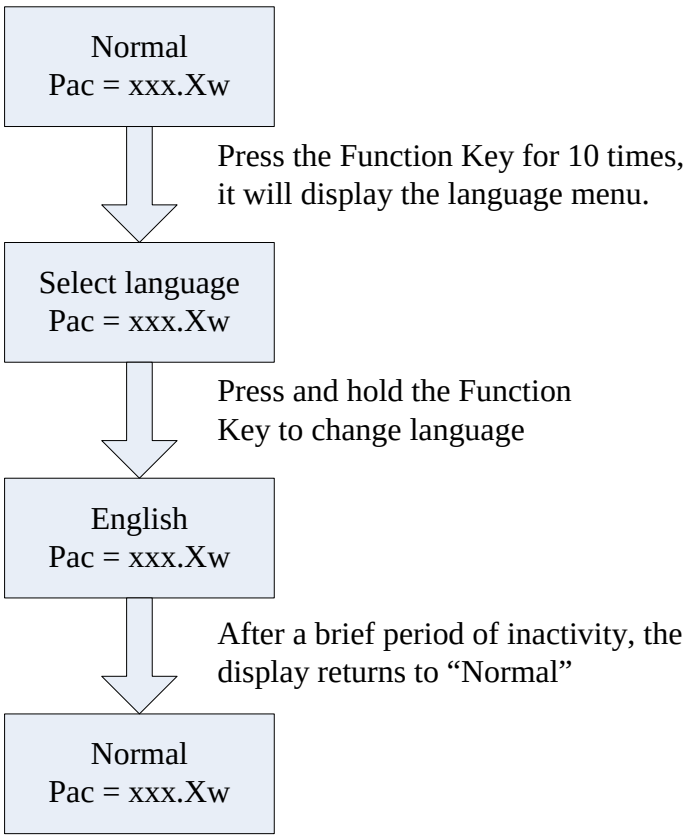
D—Function key: For settings. It can alternate among different parameters and different languages.

5.2. LCD Functions



5.3. Language Settings

Language setting function is as below:

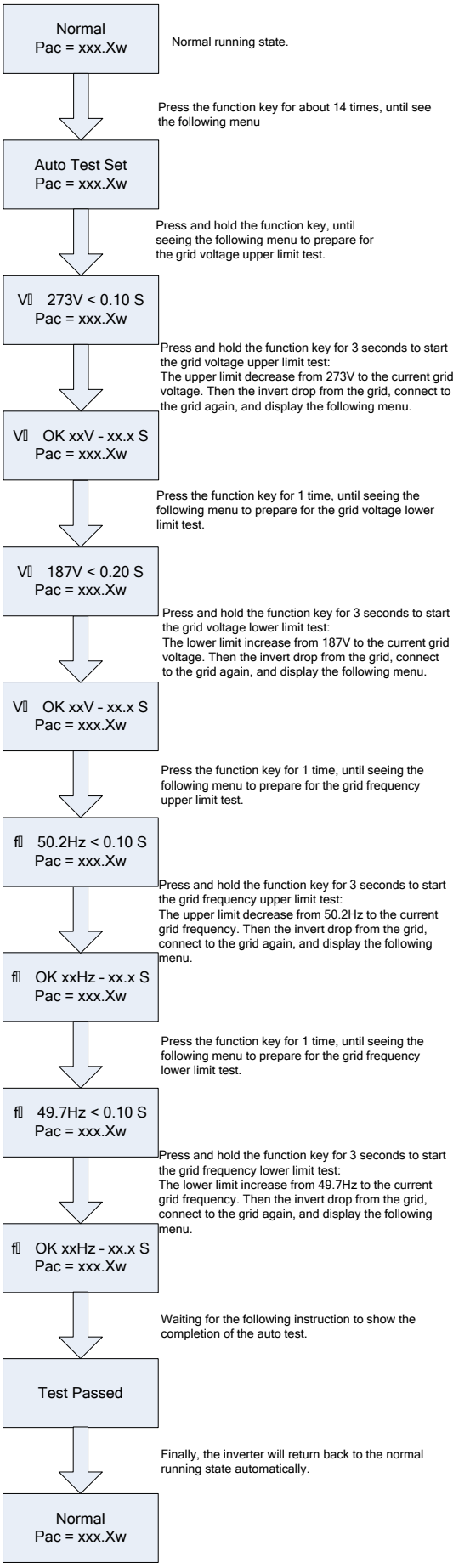


5.4. Auto Test Settings

For the customers in Italy, who need to perform the auto test function, please set according to the following instructions.

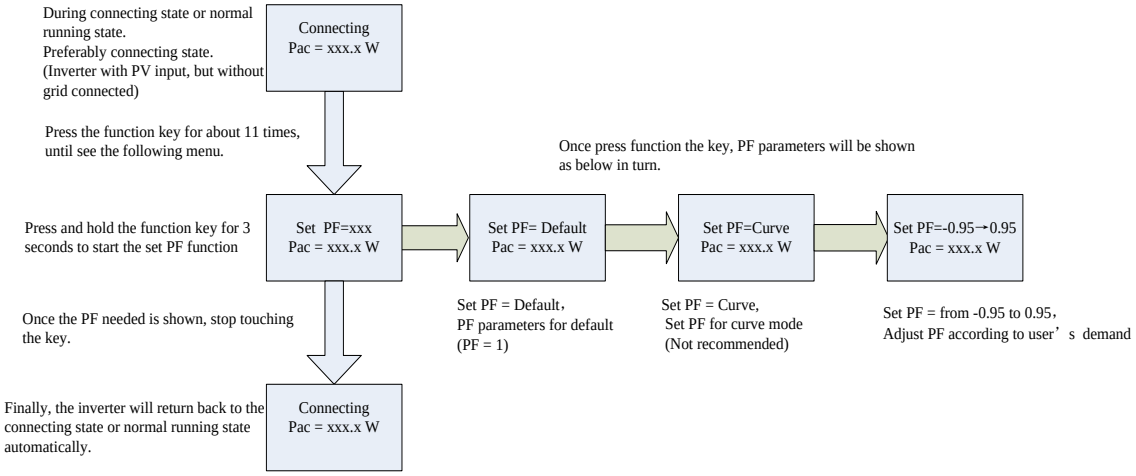
Please make sure the PV inverter is made for Italian Standard. (You will see machine type and ENEL if you press the switch for several times when the PV is running.)

During the auto test procedure, if anything abnormal happens, please wait until the inverter run normally, then make the auto test settings from the beginning.


Normal
Pac = xxx.Xw
Normal running state.
Press the function key for about 14 times, until see the following menu
Auto Test Set
Pac = xxx.Xw
Press and hold the function key, until seeing the following menu to prepare for the grid voltage upper limit test.
V 273V < 0.10 S
Pac = xxx.Xw
Press and hold the function key for 3 seconds to start the grid voltage upper limit test:
The upper limit decrease from 273V to the current grid voltage. Then the invert drop from the grid, connect to the grid again, and display the following menu.
V OK xxV - xx.x S
Pac = xxx.Xw
Press the function key for 1 time, until seeing the following menu to prepare for the grid voltage lower limit test.
V 187V < 0.20 S
Pac = xxx.Xw
Press and hold the function key for 3 seconds to start the grid voltage lower limit test:
The lower limit increase from 187V to the current grid voltage. Then the invert drop from the grid, connect to the grid again, and display the following menu.
V OK xxV - xx.x S
Pac = xxx.Xw
Press the function key for 1 time, until seeing the following menu to prepare for the grid frequency upper limit test.
f 50.2Hz < 0.10 S
Pac = xxx.Xw
Press and hold the function key for 3 seconds to start the grid frequency upper limit test:
The upper limit decrease from 50.2Hz to the current grid frequency. Then the invert drop from the grid, connect to the grid again, and display the following menu.
f OK xxHz - xx.x S
Pac = xxx.Xw
Press the function key for 1 time, until seeing the following menu to prepare for the grid frequency lower limit test.
f 49.7Hz < 0.10 S
Pac = xxx.Xw
Press and hold the function key for 3 seconds to start the grid frequency lower limit test:
The lower limit increase from 49.7Hz to the current grid frequency. Then the invert drop from the grid, connect to the grid again, and display the following menu.
f OK xxHz - xx.x S
Pac = xxx.Xw
Waiting for the following instruction to show the completion of the auto test.
Test Passed
Finally, the inverter will return back to the normal running state automatically.
Normal
Pac = xxx.Xw

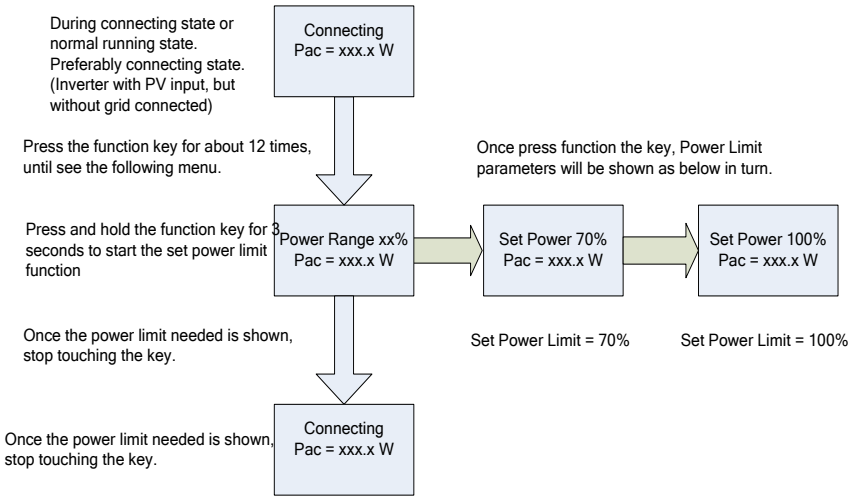
5.5. Power Factor Settings

For the VDE-AR-N 4105 standard, customers need to adjust PF.
Firstly, confirm that the inverter is set to VDE-AR-N 4105 standard.
Then do the following:


During connecting state or normal running state.
Preferably connecting state.
(Inverter with PV input, but without grid connected)
Connecting
Pac = xxx.x W
Press the function key for about 11 times, until see the following menu.
Once press function the key, PF parameters will be shown as below in turn.
Press and hold the function key for 3 seconds to start the set PF function
Set PF=xxx
Pac = xxx.x W
Set PF= Default
Pac = xxx.x W
Set PF=Curve
Pac = xxx.x W
Set PF=-0.95→0.95
Pac = xxx.x W
Set PF = Default，
PF parameters for default
(PF = 1)
Set PF = Curve,
Set PF for curve mode
(Not recommended)
Set PF = from -0.95 to 0.95，
Adjust PF according to user’s demand
Once the PF needed is shown, stop touching the key.
Finally, the inverter will return back to the connecting state or normal running state automatically.
Connecting
Pac = xxx.x W

5.6. Power Limit Settings

For the VDE-AR-N 4105 standard, customers need to adjust Power Limit.
Firstly, confirm that the inverter is set to VDE-AR-N 4105 standard.
Then do the following:


During connecting state or normal running state.
Preferably connecting state.
(Inverter with PV input, but without grid connected)
Connecting
Pac = xxx.x W
Press the function key for about 12 times, until see the following menu.
Once press function the key, Power Limit parameters will be shown as below in turn.
Press and hold the function key for 3 seconds to start the set power limit function
Power Range xx%
Pac = xxx.x W
Set Power 70%
Pac = xxx.x W
Set Power 100%
Pac = xxx.x W
Once the power limit needed is shown, stop touching the key.
Set Power Limit = 70%
Set Power Limit = 100%
Once the power limit needed is shown, stop touching the key.
Connecting
Pac = xxx.x W

6. Communication and Monitoring

6.1. Communication Interfaces

This product has a communication interface RS-232, RS-485 and Wireless (optional). Operating information like output voltage, current, frequency, fault information, etc., can be delivered to PC or hardware storage devices or other monitoring equipment via communication interface.

6.2. Communication

When user want to know the information of the power station and manage the entire power system. We offer below 2 type communications.

6.2.1. RS-232 Communication for single inverter type

RS-232 is one communication interface. It transmits the data between PC and one single PVI series inverters (Figure 6-1). For communication cable, one end is male connector; the other end is female connector. The maximum length of the cable for RS-232 is 10 m.

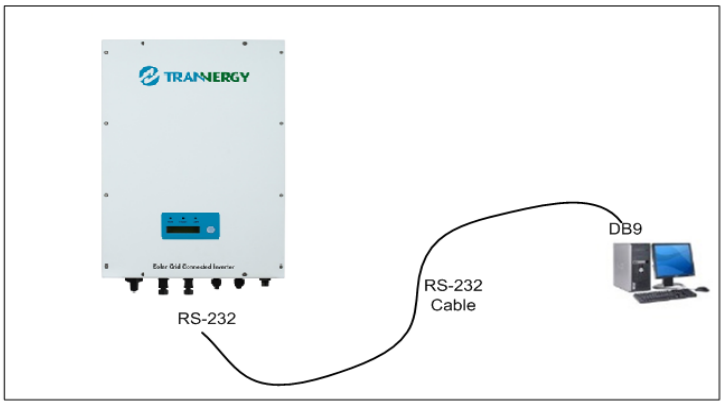
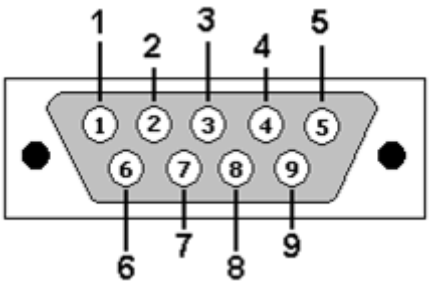


Figure 6-1 RS-232 Communication Diagram

PIN1	NC
PIN2	TXD
PIN3	RXD
PIN4	NC
PIN5	GND
PIN6	NC
PIN7	NC
PIN8	NC
PIN9	NC



Notes:

If your computer doesn't have the DB9 communication interface, you can use RS232-USB cable to achieve this function.

One inverter can only be communicated with one PC at the same time through RS-232 port. Thus this method is generally used for single inverter's communication, for examples, software updating and serviceman's testing.

6.2.2. RS-485 Communication for Several inverters

RS-485 is generally for multi inverters' communication. Up to 32 inverters could communicate at the same time, but wire length should be ≤ 1200 m. Connect the system as blow (Figure 6-2), user can easily monitoring the PV power station.

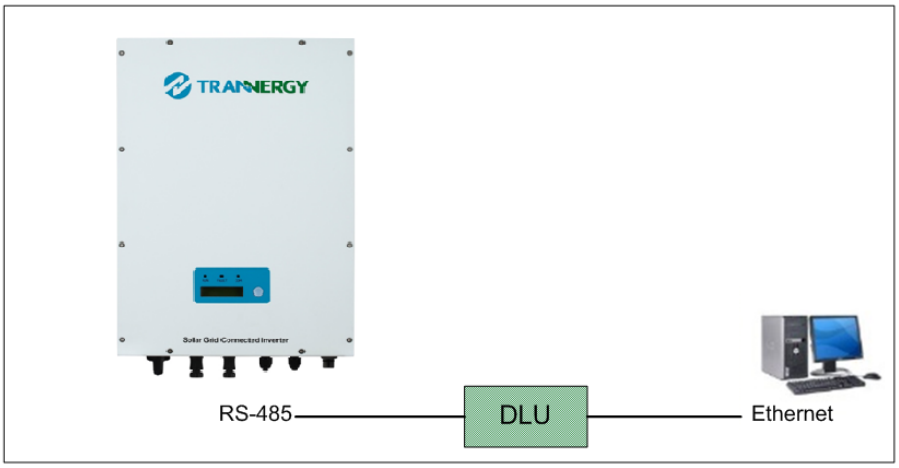
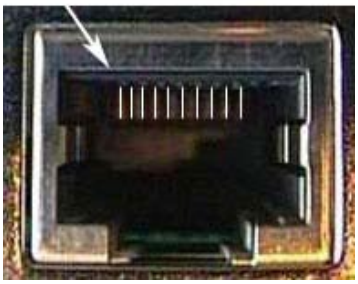


Figure 6-2 RS-485 Communication Diagram

PIN1	TXD_RS-485A	Pin 1 
PIN2	TXD_RS-485B	
PIN3	RXD_RS-485A	
PIN4	GND	
PIN5		
PIN6	RXD_RS-485B	
PIN7	+7V/DC	
PIN8		

Notes:

The wires connection sequence of two ends of a RS-485 cable is the same.

6.2.3. Wireless

PVI1300/1800/2300/2700/3000/3200/4000/4600/5400TL can be communicated with wireless. Trannergy can customize the required special device from customers to realize wireless communication.

6.3. Monitoring

System monitor PVCS should be configured to realize one PC communicates with multi inverters at the same time. Through PC PVCS could get real time PV plants operating data. Please see Installation Guide of PVCS for more information.

The connected graph of the monitoring system, in which the multipoint communication of the inverters can be realized through RS-485 interface, is shown below (Figure 6-3). The software “PVCS” in the PC can handle real-time monitoring of max 16 DLU at the same time.

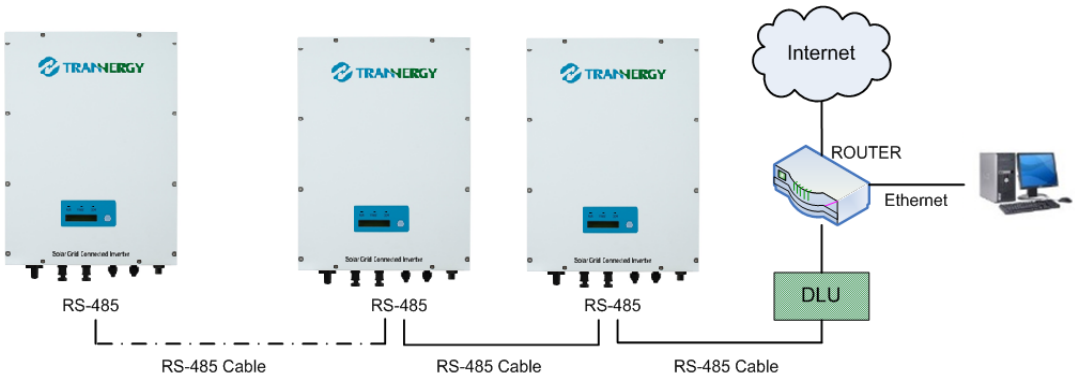


Figure 6-3 Monitoring Topology Diagram

7. Service and repair

7.1. Safety during service and repair

In this chapter the term ‘event’ describes all conditions preventing the inverter from operating properly.

An event can occur in any part of the system (grid, PV modules, cables and connectors, inverter), and does not automatically indicate an inverter failure.

Notes:

- Please note the following:
- The inverter exerts a self-protecting function.
- Events are registered in an event log.
- The inverter will attempt to reconnect when all conditions are OK.
- The inverter can pass into a locked position if an error related to functional safety is registered. This locked position will be revoked at PV shutdown/every night.

Disconnect the AC grid first!

Before the PV modules are disconnected from DC side of the inverter, the AC grid must be disconnected. The inverter must never be disconnected from the PV modules when it is feeding energy to the grid!

The inverter must only be opened by qualified personnel for repair. The inverter can still be charged with hazardous voltages even when it is disconnected from the PV modules and the grid. Measure the DC bus voltage, which must be lower than 48V, before starting work on the electronic system inside the cabinet.

Before servicing the inverters, please read Important Safety Information in Chapter 1.

7.2. Troubleshooting

If your solar system is not working properly, please follow the steps in the troubleshooting guide below before calling for assistance. The troubleshooting guide is designed to check for the most common problems, which in many cases can be solved by the owner.

Use this check list first if you experience problems with your PV system:

1) Check the event at the LCD, An event is indicated at the LCD

2) Check that AC grid voltage is within the normal range(see LCD information)

3) If not, check whether the AC isolation switch is connected, and whether the AC grid is available. If there is no AC grid in your house, the inverter automatically switches off for safety reasons. When the AC grid is once again accessible, the inverter automatically connects to the grid when there is sufficient solar radiation .Check that the grid is connected properly to the inverter and that the grid is ready for operation.

4) Check PV voltages in the display. PV voltages must be higher than 150V in order for the inverter to start. If the PV voltage is too low;

5) Check that there is sufficient solar radiation to generate power

6) Check for shading and loose cables and connections in the PV system.

7) Check the polarity of the PV side.

8) If the AC current value of the grid is not within the threshold values, please contact your utility for technical assistance.

9) If the PV system still does not supply any power to the grid, please check the voltage, current and power of the PV module as well as voltage, current and power of the grid at the LCD.

If the PV voltage is still too low or unstable, call for service support.

Notes:

Remember that only trained and authorized personnel familiar with electrical systems and safety issues are allowed to work on inverters and electrical installations.

8. Technique specification

This specification is regarding to a series of Transformerless Photovoltaic Inverters (PV Inverter) developed by Trannergy for customers. The inverter is used to convert DC power from solar array to AC power fed to grid in distributed power applications.

8.1. Electrical Specification

8.1.1. Input Specification

Model	**PVI1300TL**	**PVI1800TL**	**PVI2300TL**	**PVI2700TL**	**PVI3000TL**	**PVI3200TL**	**PVI4000TL**	**PVI4600TL**	**PVI5400TL**
Nominal DC voltage	360V								
Maximum PV open voltage	450 V_{DC}		500V_{DC}			550 V_{DC}			
MPPT voltage range	90 to 400V	125 to 400V	125 to 450V			125 to 530V			
Working voltage range	60~450 V_{DC}	125~450 V_{DC}	125~500 V_{DC}			125~550 V_{DC}			
Max. Total power in input	1300w	1800w	2300w	2900w	3200w	3200w	4000w	4600w	5400w
Initial feeding voltage	90V ±5V	120V ±5V							
Rated. Input current for each connection	16 A_{DC}	16.6 A_{DC}	16.6 A_{DC}	18 A_{DC}	18 A_{DC}	18 A_{DC}	18 A_{DC}	18 A_{DC}	18 A_{DC}
Max. Input current for each connection	18.4A_{DC}	18.4A_{DC}	18.4A_{DC}	20 A_{DC}	20 A_{DC}	20 A_{DC}	20 A_{DC}	20 A_{DC}	20 A_{DC}
Shutdown	50V	90V typical							
Number of DC connection	1	2							
Number of MPP trackers	1	1	1	1	1	1/2	1/2	1/2	2
Max .Number of each Parallel (A\B)	1								
Static MPPT efficiency	>99.5% in MPPT range								

8.1.2. Output Specification

Model	PVI1300TL	PVI1800TL	PVI2300TL	PVI2700TL	PVI3000TL	PVI3200TL	PVI4000TL	PVI4600TL	PVI5400TL
Nominal output power	1000W	1500W	2000 W	2500W	2800W	2800 W	3650 W	4000 W	4600 W
Maximum output power	1100W	1650 W	2200 W	2750W	3080W	3080 W	3650W	4400 W	5000 W
Nominal voltage	230Vac								
Operational voltage range	180 - 270 V								
Voltage range at maximum power	200 - 260 Vac								
Operational frequency range	50 Hz, 60Hz / -5 Hz ... +5 Hz								
Nominal output current	5 A_{AC}	7.7 A_{AC}	10.2 A_{AC}	12.8 A_{AC}	14.2 A_{AC}	14.2 A_{AC}	15.9 A_{AC}	20.4 A_{AC}	23.6 A_{AC}
Maximum output current	6 A_{AC}	8.4 A_{AC}	11.3 A_{AC}	14 A_{AC}	15.7 A_{AC}	15.7 A_{AC}	15.9 A_{AC}	22.5 A_{AC}	26 A_{AC}
THDi	<1%	<1%							
Power Factor	>0.99								

8.1.3. General Data

Model	PVI1300TL	PVI1800TL	PVI2300TL	PVI2700TL	PVI3000TL	PVI3200TL	PVI4000TL	PVI4600TL	PVI5400TL
Internal power consumption	<5W	<5W		<6W	<6W	<6W	<6W	<6W	<6W
Standby power (at night)	<0.2W								
Maximum Conversion Efficiency (DC/AC)	>97.1%	>97.1%		>97.1%	>97.1%	>97.6%	>97.6%	>97.6%	>97.6%
European Efficiency	>96.5%	>96.5%		>96.5%	>96.5%	>96.5%	>96.5%	>97%	>97%
Protection degree	IP65								

Operation temperature	-20 to +60ºC （up 45 ºC derating）				
Humidity	0 to 95%, non-condensing				
Heat Dissipation	Air convection				
Acoustic noise level	<35dB	<40dB			
Altitude	Up to 2000m above sea level without derating				
Manufacturing process	Unleaded, meet RoHS				
DC switch	Optional				
Weight [kg]	14	27.5	27.8	28	29.5
Size [mm]	418x318x143	505x365x155			

9. Qualification

We grant a warranty of 60 months as standard, starting from the date of the purchase invoice marked. We will only perform warranty services when the faulty unit is returned to us together with a copy of the invoice and warranty card which are issued by the dealer to the user. The unit should be returned in its original or equivalent packaging, please preserve the original packing. The costs for new packing and shipment are absorbed by the customer. In addition, the type label on the unit must be fully legible. If these requirements are not fulfilled, we reserve the right to deny warranty services.

Warranty claims are excluded for direct or indirect damages due to:

1) Beyond warranty date;
2) Without warranty card and serial number;
3) Transport damage;
4) Improper use, operation and refitting;
5) Non-observance to the relevant safety instructions and work in the severe environment out of the recommended ones in this manual;
6) Beyond installation and use areas of the relevant international standards;
7) Influence of foreign objects and force majeure (lightning strike, overvoltage, severe weather, fire etc).

10. Contact Information

If you have any further technical questions about our products, please contact us:

Trannergy Co., Ltd.
www.trannergy.com
Add: No.188, Weiwu Road, Jiading District, Shanghai, China, 201802
Tel: +86 21 38953908
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E-mail: info@trannergy.com

Appendix A: FAQ (Frequently asked questions)

Sometimes, the PV system does not work normally; we recommend the following solutions for average troubleshooting. This can help the technician to understand the problem and take a proper action.

	LCD display	Possible actions
Resumable Fault	Isolation Fault	1. Check the impedance between PV (+)&PV(-) and the inverter is earthed. The impedance must be greater than 2MΩ 2. Check whether the AC end has contacted with earth
	Ground Fault	1. The ground current is too high 2. After cutting off the AC end connection, unplug the inputs from the PV generator and check the peripheral AC system. 3. After the cause is cleared, re-plug the PV generator and AC connection, and check PV-Inverter status.
	Grid Fault Fac Over Range Vac Over Range	1. Wait for a moment, if the grid returns to normal, PV-Inverter automatically restarts. 2. Make sure grid voltage and frequency meet the specifications.
	Utility Loss	1. Grid is not connected. 2. Check grid connection cables. 3. Check grid usability. 4. If grid is ok, the problem persists, maybe the fuse in the inverter is open, please call the service.
	Over Temperature	1. The internal temperature is higher than specified normal value. 2. Find a way to reduce the ambient temperature or move the inverter to cooler environment.

Appendix B: Abbreviation

AC	Alternating Current
DC	Direct Current
DLU	Data Logger Unit
DSP	Digital Signal Processing
EEPROM	Electrically Erasable Programmable Read-Only Memory
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
GFCI	Ground Fault Circuit Interrupter
HCT	Hall Current Transformer
HMI	Human Machine Interface
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MPPT	Maximum Power Point Track
PC	Personal Computer
PV	Photovoltaic
PVCS	Photovoltaic Control System
SCI	Serial Communication Interface